

Example 1

5 pounds of chlorine in 7 million pounds of water equals what concentration in ppm?

$$\text{ppm} = \frac{\# \text{Chem}}{M \# H_2O} \quad \text{ppm} = \frac{5 \# Cl}{7M \# H_2O} = 0.71 \text{ ppm}$$

Example 2

5 pounds of chlorine in 200,000 pounds of water equals what concentration in ppm?

$$\text{ppm} = \frac{\# \text{Chem}}{M \# H_2O} \quad \text{ppm} = \frac{5 \# Cl}{0.2 M \# H_2O} \quad \frac{200,000 \# H_2O}{1,000,000} = 0.2 M \# H_2O$$

$$= 2.5 \text{ ppm}$$

Example 3

6 pounds of chlorine in 15,000 gallons equals what concentration in ppm?

$$\text{ppm} = \frac{\# \text{Chem}}{M \# H_2O} \quad \text{ppm} = \frac{6 \# Cl}{0.125 M \#} = 48 \text{ ppm}$$

$$15,000 \text{ gal} \times \frac{8.34 \#}{\text{gal}} = 125,100 \# \times \frac{M}{1,000,000} = 0.125 M \#$$

Example 4

Theoretically, how many pounds of pure chlorine must be added to 900,000 gallons of water to produce a residual of 2.0 ppm?

$$\text{ppm} = \frac{\# \text{Chem}}{M \# H_2O} \quad 2.0 \text{ ppm} = \frac{\# \text{Chem}}{7.5 M \# H_2O} \quad 2.0 \text{ ppm} \times 7.5 M \# H_2O = 15 \# Cl$$

$$900,000 \text{ gal} \times \frac{8.34 \#}{\text{gal}} = 7506000 \# H_2O \times \frac{M}{1,000,000} = 7.5 M \# H_2O$$

Example 5

Your well pumps at 200 gpm and you desire a chlorine residual of 0.5 ppm. How much chlorine gas do you need per day?

$$\text{ppm} = \frac{\# \text{Chem}}{M \# H_2O} \quad 0.5 \text{ ppm} = \frac{\# \text{Chem}}{2.4 M \# H_2O} \quad 0.5 \text{ ppm} \times 2.4 M \# H_2O = 1.2 \# Cl$$

$$\frac{200 \text{ gal}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{day}} = 288,000 \text{ gal}$$

$$288,000 \text{ gal} \times \frac{8.34 \#}{\text{gal}} = \frac{2401920 \# H_2O}{1,000,000} = 2.4 M \# H_2O$$

Sample 1

10 lbs of chlorine in 100,000 lbs of water equals what concentration in ppm?

$$\text{PPM} = \frac{\# \text{Chem}}{M \# H_2O}$$

$$\frac{100,000 \# H_2O}{1,000,000} = 0.1 M \# H_2O$$

$$\text{PPM} = \frac{10 \# Cl}{0.1 M \# H_2O} = 100 \text{ ppm}$$

Sample 2

If 42 lbs of chlorine are added to 4,000,000 gal of water, what is the concentration of chlorine?

$$\text{PPM} = \frac{\# \text{Chem}}{M \# H_2O}$$

$$4,000,000 \text{ gal} \times \frac{8.34 \#}{\text{gal}} = \frac{33,360,000 \#}{1,000,000}$$

$$\text{PPM} = \frac{42 \# Cl}{33,360 M \# H_2O} = 1.25 \text{ ppm}$$

$$= 33.36 M \# H_2O$$

Sample 3

100,000 gallons of water receives 1 pound of chlorine. What is the chlorine concentration?

$$\text{PPM} = \frac{\# \text{Chem}}{M \# H_2O}$$

$$100,000 \text{ gal} \times \frac{8.34 \#}{\text{gal}} = \frac{834,000 \# H_2O}{1,000,000}$$

$$\text{PPM} = \frac{1 \# Cl}{0.834 M \# H_2O} = 1.199$$

$$= 0.834 M \# H_2O$$

$$1.2 \text{ ppm}$$

Example 6

How many pounds of chlorine are in 4 pounds of a compound that has 65% available chlorine?

$$4 \text{ lb compd} \quad 65\% \text{ avail Cl} \quad \frac{65 \text{ lb Cl}}{100 \text{ lb Compd}}$$

$$4 \text{ lb compd} \times \frac{65 \text{ lb Cl}}{100 \text{ lb Compd}} = 2.6 \text{ lb Cl}$$

Example 7

How many pounds of chlorine are in 5 gallons of solution that weighs 10.4 pounds per gallon and has 10% available chlorine? Sometimes the compound that contains the desired chemical is a liquid. Before the amount of available chemical is determined, the weight of the compound must be calculated.

$$5 \text{ gal sol.} \quad \frac{10.4 \text{ lb}}{\text{gal sol}} \quad 10\% \text{ Cl} = \frac{10 \text{ lb Cl}}{100 \text{ lb sol.}}$$

$$5 \text{ gal sol.} \times \frac{10.4 \text{ lb}}{\text{gal sol}} = 52 \text{ lb sol.}$$

$$52 \text{ lb sol.} \times \frac{10 \text{ lb Cl}}{100 \text{ lb sol}} = 5.2 \text{ lb Cl}$$

Example
Sample 7

If a system pumps 100,000 gpd (gal/day) and feeds 2.0 ppm of chlorine, how many gallons of 10% sodium hypochlorite will be used in a day? How many gallons of 5% sodium hypochlorite? (Assume 5% and 10% sodium hypochlorite weigh 10 lbs/gal)

$$ppm = \frac{\text{lbs of chemical}}{\text{million lbs water}} \quad \text{OR} \quad \text{lbs of chemical} = ppm \times \text{million lbs water}$$

$$100,000 \text{ gal} \times \frac{8.34 \text{ lbs}}{\text{gal}} = 834,000 \text{ lbs of water}$$

$$834,000 \text{ lbs of water} = 0.834 \text{ million lbs water}$$

$$0.834 \text{ million lbs of water} \times 2.0 \text{ ppm} = 1.67 \text{ lbs of chlorine}$$

For 10% sodium hypochlorite :

$$1.67 \text{ lbs of pure chlorine} \times \frac{100 \text{ lbs compound}}{10 \text{ lbs pure chlorine}} = 16.7 \text{ lbs 10\% sodium hypochlorite}$$

$$16.7 \text{ lbs 10\% sodium hypochlorite} \times \frac{1 \text{ gal}}{10 \text{ lbs}} = 1.67 \text{ gallons}$$

For 5% sodium hypochlorite :

$$1.67 \text{ lbs of pure chlorine} \times \frac{100 \text{ lbs compound}}{5 \text{ lbs pure chlorine}} = 33.4 \text{ lbs 5 \% sodium hypochlorite}$$

$$33.4 \text{ lbs 5 \% sodium hypochlorite} \times \frac{1 \text{ gal}}{10 \text{ lbs}} = 3.34 \text{ gallons}$$

Sample 8

If a system pumps 75,000 gpd and feeds 3.1 ppm of chlorine, how many gallons of 12% sodium hypochlorite will be used in a day? (Assume 12% sodium hypochlorite weighs 10 lbs/gal)

$$\frac{75,000 \text{ gal}}{\text{day}} \quad 3.1 \text{ ppm} \quad 12\% \text{ sal.} = \frac{12 \text{ lb Cl}}{100 \text{ lb sal}} \quad \frac{10 \text{ lb}}{\text{gal}}$$

$$\textcircled{1} \quad \text{PPM} = \frac{\# \text{ Chem}}{M \# H_2O} \quad 3.1 \text{ ppm} = \frac{\# \text{ Chem}}{0.6255 M \# H_2O}$$

$$3.1 \text{ ppm} \times 0.6255 M \# H_2O = 1.94 \text{ lb Cl}$$

$$\frac{75,000 \text{ gal}}{\text{day}} \times \frac{8.34 \text{ lb}}{\text{gal}} \times \frac{M}{1,000,000} = 0.6255 M \# H_2O$$

$$\textcircled{2} \quad 1.94 \text{ lb Cl} \times \frac{100 \text{ lb sal}}{12 \text{ lb Cl}} = 16.16 \text{ lb sal} \times \frac{\text{gal}}{10 \text{ lb}} = 1.6 \text{ gal}$$

Sample 9

If a well pumps at a rate of 200 gpm and the chlorine Residual is 0.5 ppm. If your demand is 2 ppm, how many gallons of 10% sodium hypochlorite will be used per day? (Assume the solution weighs 10 lbs/gal)

$$\frac{200 \text{ gal}}{\text{min}} \quad \text{Residual + Demand} = \text{Dose} \quad 10\% \text{ sal} = \frac{10 \text{ lb Cl}}{100 \text{ lb sal}}$$

$$\frac{0.5 \text{ ppm} + 2 \text{ ppm}}{} = 2.5 \text{ ppm}$$

$$\frac{10 \text{ lb}}{\text{gal}}$$

$$\text{PPM} = \frac{\# \text{ Chem}}{M \# H_2O} \quad 2.5 \text{ ppm} = \frac{\# Cl}{0.4 M \# H_2O} \Rightarrow 2.5 \text{ ppm} \times 0.4 M \# H_2O = 6 \text{ lb Cl}$$

$$6 \text{ lb Cl} \times \frac{100 \text{ lb sal}}{10 \text{ lb Cl}} = 60 \text{ lb sal}$$

$$60 \text{ lb sal} \times \frac{\text{gal}}{10 \text{ lb}} = 6 \text{ gal sal.}$$

$$\frac{200 \text{ gal}}{\text{min}} \times \frac{60 \text{ min}}{\text{hr}} \times \frac{24 \text{ hr}}{\text{day}} = 288,000 \text{ gal} \times \frac{8.34 \text{ lb}}{\text{gal}} = \frac{2,401,928 \text{ lb}}{1,000,000}$$